Capacitance Sorting Meter

- Make your job efficiency

User Instruction Manual

User Programmable Functions

Capacitance Sorting Meter

INSTRUCTION MANUAL

REVISION HISTORY

Version	Change Summary	Date	Author
1.0	Created	2006/9/08	LT
1.1	Modification	2006/10/04	LT
1.2	Update measuring rate	2006/10/20	LT
1.3	1. Change Figure of Auto power off. 2. Backlit bright setting for ON/OFF state 3. Update measuring rate 4. Power consumption	2006/11/30	LT

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SAFETY INFORMATION

This meter is a hand-held, battery-operated instrument for testing and sorting capacitance. If this device is damaged or something is missing, contact the purchasing place immediately.

A **WARNING** identifies conditions and actions that may cause hazard(s) to the user; a **CAUTION** identifies conditions and actions that may damage this Device. Following **Table-1** explain international electrical symbols used on this meter.

Table- 1 International Electrical Symbols

	DC - Direct Current
	Caution, risk of danger (See Explanation In The Manual)

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☐ SAFETY INFORMATION

⚠ *Warnings and Cautions*

To avoid electric shock, injury, or damage to this instrument and ensure that you use the meter safely, follow the safety guidelines listed below:

- Read this operation manual completely before using this device and follow all safety instructions.
- This device is for indoor use, altitude up to 2,000 m.
- Avoid working alone.
- Use the device only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- Never measure Voltage with this meter.
- Do not use this device if it looks damaged.
- Inspect the leads for damaged insulation or exposed metal. Replace damaged leads.
- Disconnect the power and discharge all high-voltage capacitors before testing.
- Be cautions when working above 70V DC or 33VRMS and 46.7V peak, such voltages may cause a shock hazard.
- Always use specified battery.
- The meter is designed in compliance with EN61010 (IEC1010-1) Installation Category II 50V Pollution Degree 2.
- CE requirement: Under the influence of RF field according to standard, the supplied test leads will pick up induced noise. To have better shielding effect, a short-twisted lead should be used.

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QUICK START

⚠ WARNING
Read "SAFETY INFORMATION" before using this device.

1. Push to turn on the meter.
2. Push **REL** to subtract the residual capacitance as not yet insert capacitor into sockets and terminals.
3. Insert the leads of capacitor into "**+**" and "**-**" input sockets, respectively.
4. Be sure the polarity for capacitor and remove your hands from capacitor to be tested.
5. Read the display.

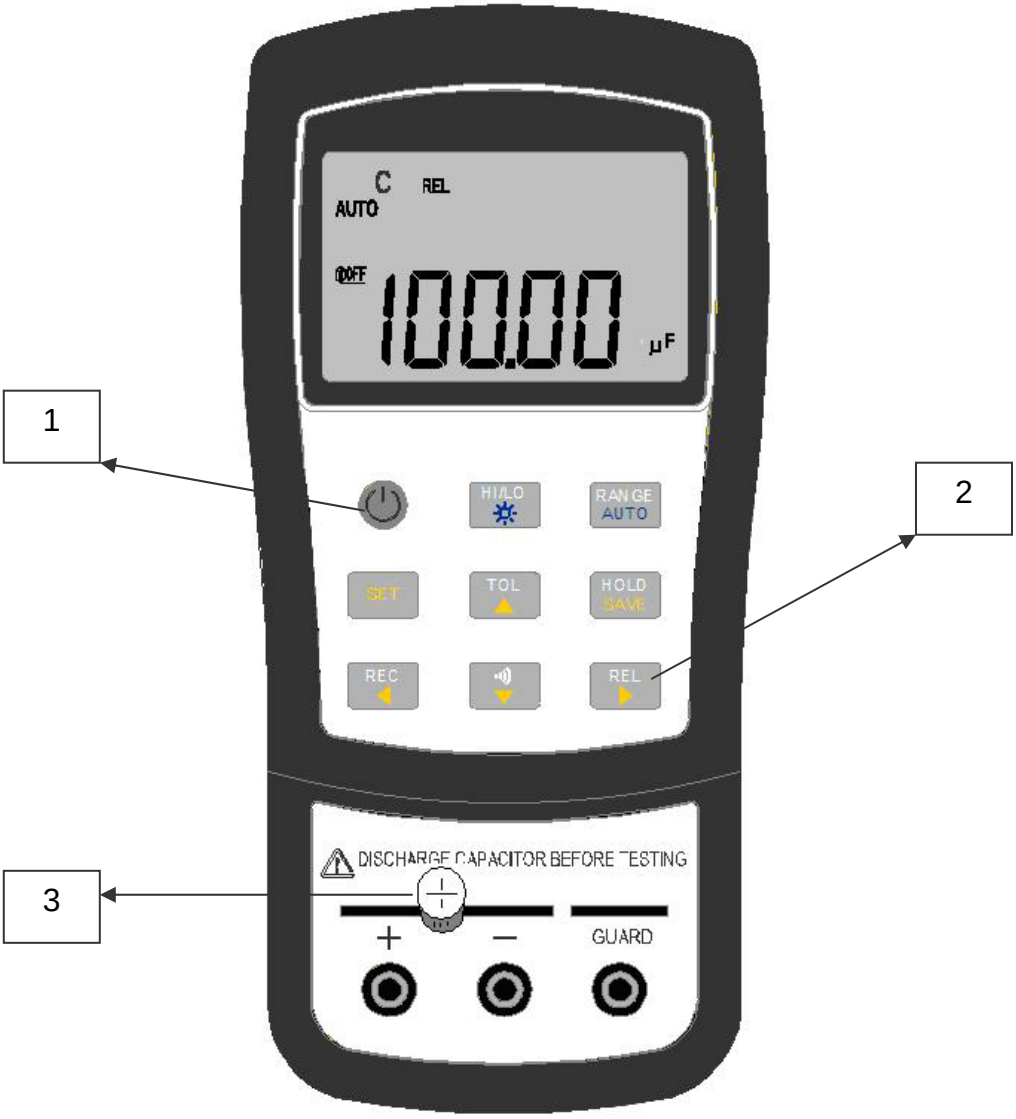

Figure- 1 Capacitance measurement

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CAPACITANCE SORTING METER

■ *Introduction*

This meter is uniquely designed for capacitor sorting. It's a fully auto ranging 11000 count meter. Manual ranging can be selected via the front push button.

Main Features:

- **Auto-range, 11000 count resolution and large LCD with dual display.**
- **Wide range resolution and measurement from 0.1pF to 199.99 mF.**
- **Visible and audible Tolerance mode assists you to sort the capacitor.**
- **Comparison mode with 25 sets for High / Low Limit setting, included non-volatile memory inside, will keep your setting even the power off.**
- **Static Recording, you will know maximum, average and minimum values without calculator.**
- **Relative mode will help you to calculate the difference between a standard and a measuring value.**
- **Data Hold with Manual or Auto Trigger**
- **Bi-directional optic computer interface with SCPI commands will assist you to a specialist and make report easier.**
- **Low battery indication**
- **Brightness LED backlight**
- **Safe, precision and speed closed case calibration**

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GETTING START WITH YOUR METER

■ *Display Illustration*

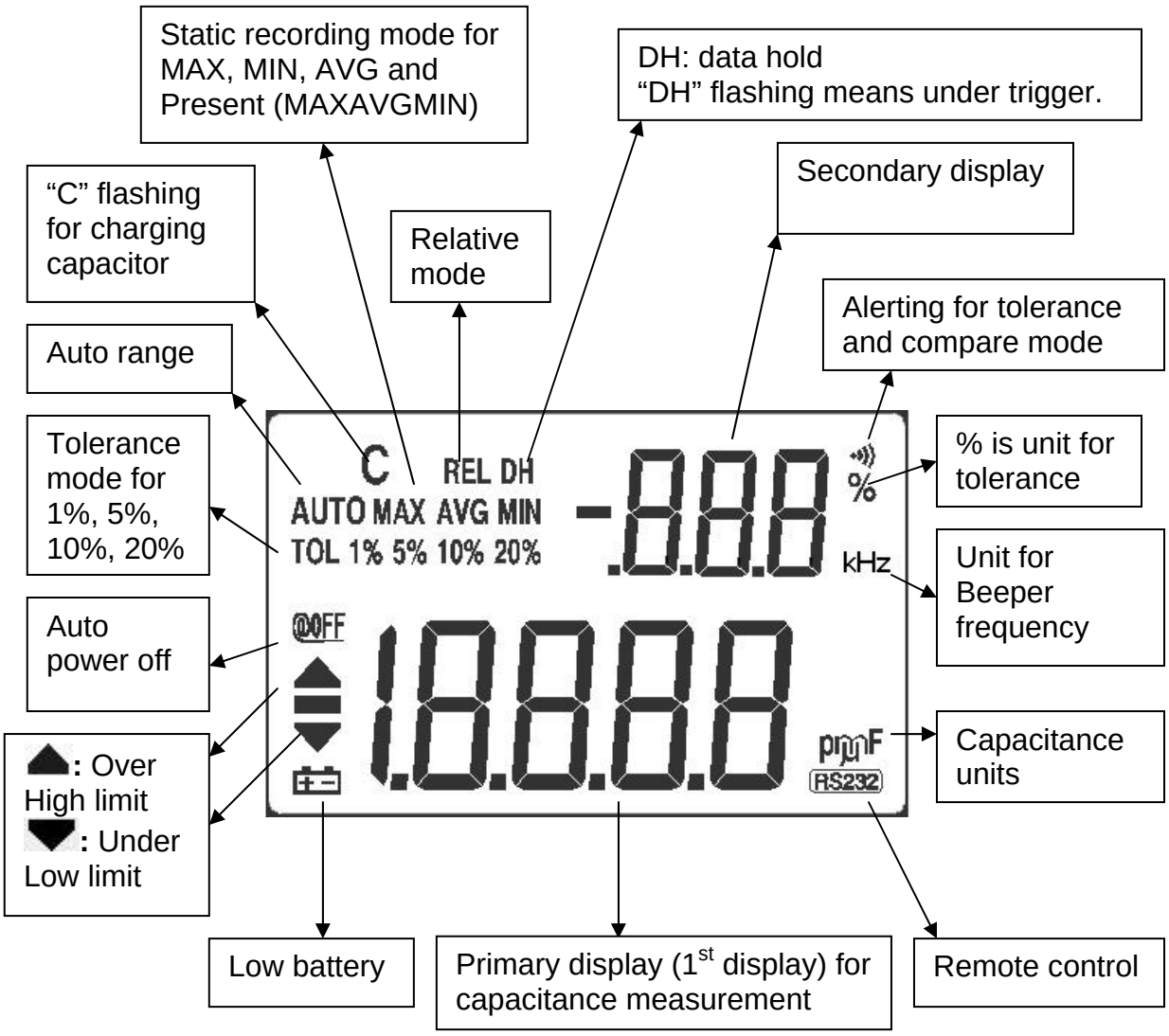

Figure- 2 LCD Display

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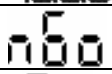
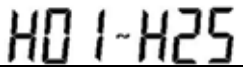
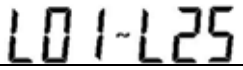
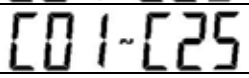
Item	Annunciator	Description
1)	**AUTO**	AUTO range
2)	**TOL 1% 5% 10% 20%**	Tolerance mode, to set 1%, 5%, 10% and 20% for sorting capacitance.
3)		Primary display (1st display).
4)		Audible alert for tolerance or compare mode
5)	**DH**	Data hold
6)		Low battery indication.
7)	**REL**	Relative mode
8)	**pF**	1/1000,000,000,000 Farad
9)	**nF**	1/1000,000,000 Farad
10)	**μF**	1/1000,000Farad
11)	**mF**	1/1000 Farad
12)	**MAX AVG MIN**	Static recording mode, indicates the present reading
13)	**MAX**	Maximum reading
14)	**AVG**	Average reading
15)	**MIN**	Minimum reading
16)		Remote control
17)		Secondary display (2nd display).
18)		Reading out of the HI/LO limits
19)		Reading within the HI/LO limits
20)		The primary display shows HI limit setting
21)		The primary display shows LO limit setting
22)		Display the HI/ LO limit set for compare mode.
23)		Reading out of the HI limit
24)		Reading out of the LO limit
25)	**%**	Unit for tolerance display.
26)	**C**	Charging period will be flashed, display as discharging period.
27)		Enable Auto power off
28)	**kHz**	Unit for Beeper Frequency as setup mode

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■ *Terminals*

> **⚠WARNING**
> **To avoid damaging this device, discharge the capacitor before testing. Be sure the polarity for capacitance measurement**

To avoid damaging this meter, do not exceed the input limit. Do not apply voltage to input terminals. Discharge the capacitor before testing.

1) Positive terminal/ socket
2) Negative terminal/ socket
3) Guard terminal/ socket

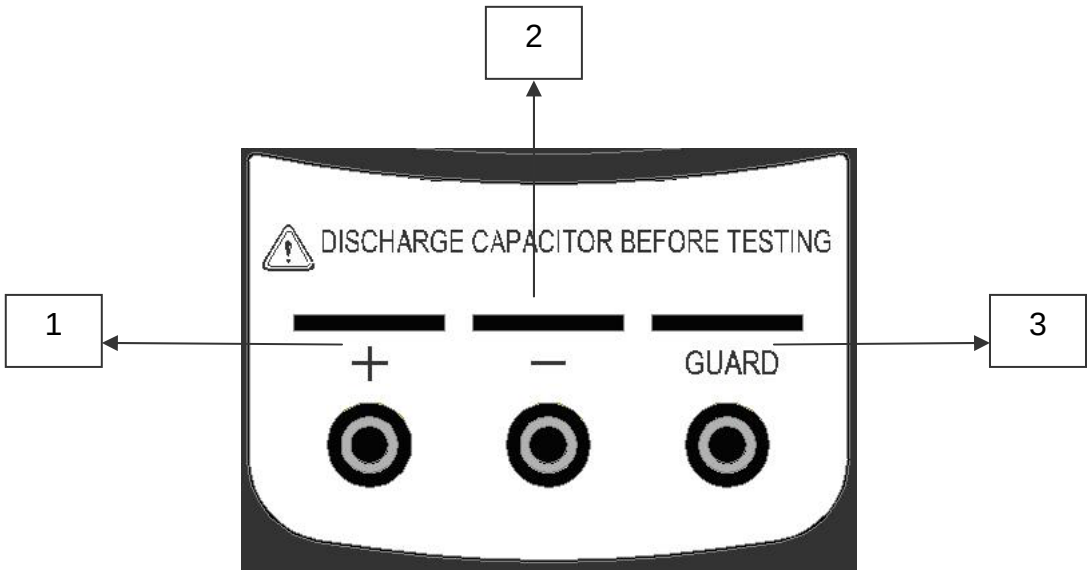

Figure- 3 Terminals

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■ *Push-button operations*

The operation of push-button is shown as below. When push the button, a related symbol will be lit, and the beeper will sound.

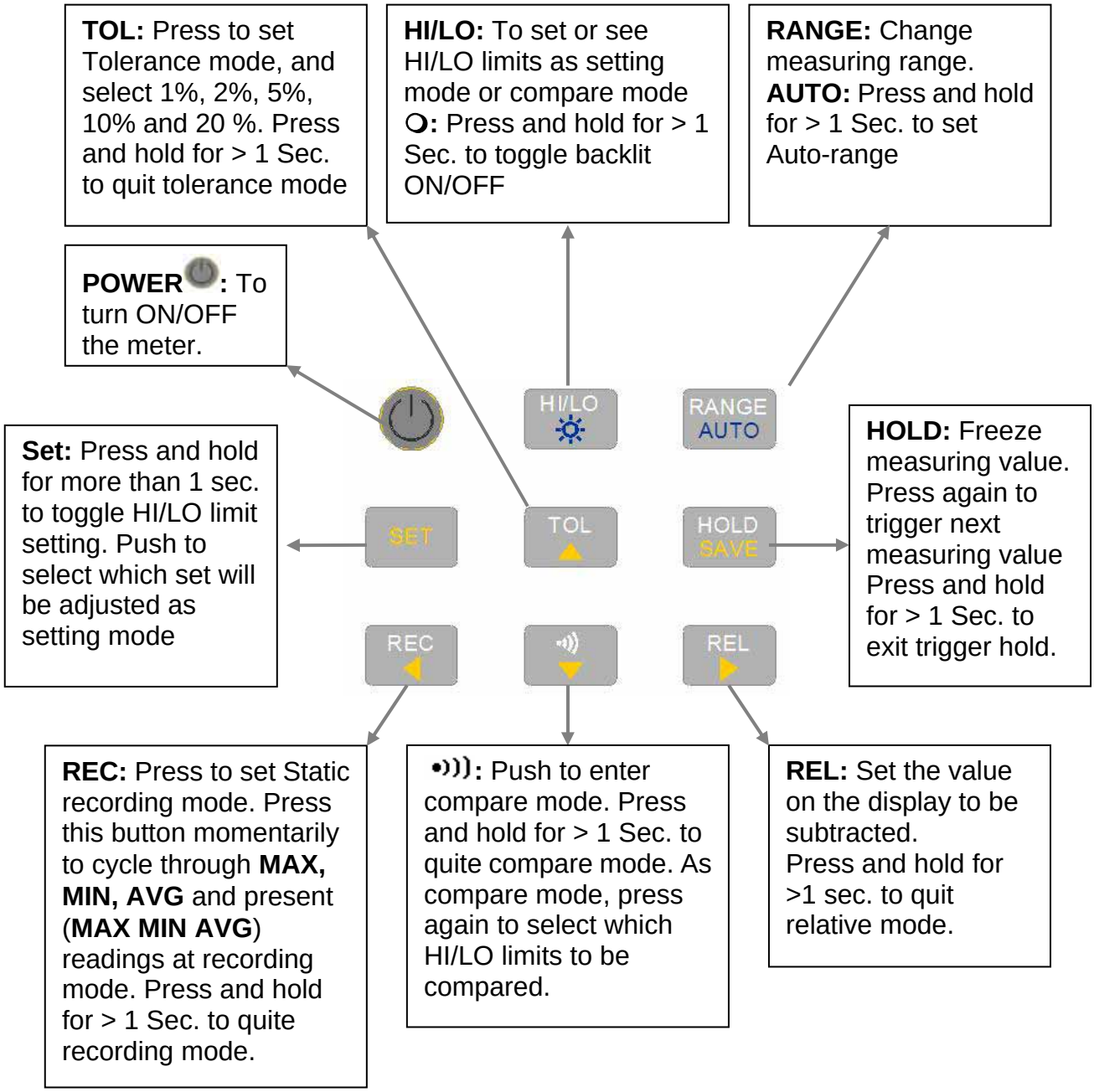
TOL: Press to set Tolerance mode, and select 1%, 2%, 5%, 10% and 20 %. Press and hold for > 1 Sec. to quit tolerance mode
HI/LO: To set or see HI/LO limits as setting mode or compare mode
❍**:** Press and hold for > 1 Sec. to toggle backlit ON/OFF
RANGE: Change measuring range.
AUTO: Press and hold for > 1 Sec. to set Auto-range
POWER **:** To turn ON/OFF the meter.
Set: Press and hold for more than 1 sec. to toggle HI/LO limit setting. Push to select which set will be adjusted as setting mode
HOLD: Freeze measuring value. Press again to trigger next measuring value Press and hold for > 1 Sec. to exit trigger hold.
HI/LO
RANGE AUTO
SET
TOL
HOLD SAVE
REC
REL
REC: Press to set Static recording mode. Press this button momentarily to cycle through **MAX, MIN, AVG** and present (**MAX MIN AVG**) readings at recording mode. Press and hold for > 1 Sec. to quite recording mode.
•))) **:** Push to enter compare mode. Press and hold for > 1 Sec. to quite compare mode. As compare mode, press again to select which HI/LO limits to be compared.
REL: Set the value on the display to be subtracted.
Press and hold for >1 sec. to quit relative mode.

Figure- 4 Pushbuttons

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1. **:** Power ON or OFF

- This button is used to toggle the power ON or OFF for the meter. Be sure to press button completely to be locked or released.

2. **HOLD:** Data Hold

- Press the button to enable the data hold function. The function allows operator to hold the displayed digital value.
- Press this button momentarily to trigger holding next reading.
- Press this button for more than 1 second to exit the mode.

3. **REC:** Static Recording

- Press "**REC**" button to enable the recording function.
- Press "**REC**" button momentarily to cycle through maximum, minimum, average and present readings. The **MAX**, **MIN**, **AVG** or **MAX AVG MIN** annunciator turns on respectively to indicate which value is being displayed.
- Press "**REC**" button for more than 1 second to exit the recording mode.
- The beeper sounds a tone when a new MAX or MIN value has been recorded.
- The static recording captures stable values and updates the memory; it will not record the values are "**OL**" (overload) or below 10 count value.

4. **REL: Relative function**

- The function shows the difference between the measured value and the offset reference value. The display may show a non-zero value due to the presence of test leads. You can use the relative function to nullify the residual.
- Press "**REL**" button to enable the relative function, and the "**REL**" sign will be displayed. Press "**REL**" button again to renew relative value again.
- Press "**REL**" button for more than 1 second to exit the mode.
- The relative function can operate in both auto and manual ranging mode but the function cannot be set when an overload value exists.

5. **RANGE:** Auto/ Manual Range

- Press this button to select manual range and turn off the "**AUTO**" annunciator. Press this button momentarily to step up a range at a time.
- In auto-range, the "**AUTO**" annunciator is lit and the meter will select an appropriate range for resolution if a reading is greater than maximum available range, "**OL**" (overload) will be displayed on the display. The meter will select a lower range when reading is less than about 9% of full scale.
- Press this button for more than 1 second to select auto-range.

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6. TOL: Tolerance mode

- With capacitor into the terminals, press the "**TOL**" button to enable the tolerance mode and set the display value to be a standard reference. The "**TOL**" annunciator will be indicated, and tolerance will be indicated on the secondary display. The meter range is locked also.
- Press the "**TOL**" button momentarily again to cycle through 1%, 5%, 10% and 20% tolerance as desire. The alerting sign of " •))) " will be indicated accompanying. The beeper sounds a tone while the test value is within the selected tolerance. If the test value is out of the selected tolerance, the beeper will sound three tones.
- This mode can not be enabled under following condition:
  a. After setting the recording mode.
  b. After setting the Compare mode.
  c. The display shows either OL or below 10 counts.
- Press and hold this button for more than 1 second to exit tolerance mode.

7. •))) : Compare Mode

- Press this button to enable the compare mode. The measuring range is locked in this mode. The " •))) " annunciator will be shown, and the secondary display will indicate "**C # #**" meaning which set has been used for compare mode. The two right digits indicate current compare set. The "# #" is from 01 to 25. The primary display shows the present measurement. In this state, it is ready for testing. If the reading is out of the high limit (Sign "▲" lit) and the low limit (Sign"▼" lit), three tones will be sounded, also the secondary display indicates "**nGo**". If the reading is within the high and the low limits, the beeper sounds a tone, and the secondary display indicates "**Go**". After 3 seconds or the reading lower than 10 counts, the meter will return to ready state.
- Press this button momentarily to select different settings for compare. The secondary display will indicate "**C01**" to "**C25**" according to which comparison record has been selected. You can press and hold **SAVE** button for more than one second to save comparison set for next entry.
- Press this button for more than 1 second to exit the mode.

8. HI/LO: High/Low limits

- Press this button momentarily to see the High/Low limit value to be used as compare mode. Press this button to cycle through High limit, Low limit and present values on primary display. The secondary display showed as "**H # #**", "**L # #**" and "**C # #**" respectively. After 3 seconds without pressing this button again, it will return present value display.
- In the High/ Low limit setting mode, press this button momentarily to toggle HI and LO limits for adjustment.

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9. SET: set high/low limits for compare mode

- Press the **SET** button for more than 1 second to enter the HI/LO limit setting mode. The secondary display will flash "**H01**" and the primary display will indicate the value of High limit. Following buttons will be used for this setting mode:
  a. ◀ **(LEFT)** or ▶ **(RIGHT)**: select which digit will be adjusted.
  b. ▲ **(UP)** or ▼ **(DOWN)**: to Increase or decrease the current digit value.
  c. **HI/LO:** Select High or Low limit to be set.
  d. **SAVE:** Press this button for more than 1 second to store the setting value into the memory. The beeper will sound two tones means the selected value has been stored. If the current setting can't meet the rule that the high limit must equal or greater than the low limit, the beeper sounds three tones ("BE-BE-BE").
  e. **SET:** Select next compare setting. Press this button momentarily to cycle through L01 (or H01) to L25 (or H25) then come back to L01 (H01) setting.

- Press the **SET** button again for more than 1 second to exit the HI/LO limit setting mode.

10. Back-Lit

- Press this button for more than 1 second to toggle backlit ON/ OFF. Backlit turns off automatically after setting period by setup mode.

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POWER-ON OPTION

To select power-on options, press and hold the pushbutton while turning the ON/OFF switch to on position. These power-on options are listed in below table**:**

Table- 2 Power-ON Options

PUSHBUTTON	DESCRIPTION
HOLD	**Demonstrate Annunciators** To demonstrate the annunciators, the entire annunciators will be displayed. Press any button to exit demonstration mode.
•))	Reset the high and the low limits to manufacture's default values.
RANGE	Fast power off test for manufacture purpose
REL	To see the firmware version
SET	**Setup mode** Configure related parameter, please refer to how to enter setup mode for detail.

■ *Demonstrate display annunciators*

To demonstrate the annunciators, press the **HOLD** button and turn on the meter simultaneously. All annunciators will be displayed. Press any button to exit demonstration mode.

■ *Default factory HI/LO setting*

To set the high and the low limits to manufacture's default values.

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HOW TO ENTER SETUP MODE

Press and hold **SET** button, then turn on the meter from OFF. Release push button when you hear a tone, the meter will enter setup mode then. These parameters will be remained in non-versatile memory even the meter is turned off. You can configure related parameters on setup mode by following procedures:

1. Press ◀ **(LEFT)** or ▶ **(RIGHT)** button to select which menu item to be set.
2. Press ▲ **(UP)** or ▼ **(DOWN)** button to change the parameter.
3. Press "**SET**" button to select which digit to be adjust, the selected digit will be flashed.
4. Press and hold "**SAVE**" button for more than one second to save your setting.
5. Push "**SET**" button for more than one second to exit setup mode.

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■ *Factory Default*

Following Table describes the outline of the setup menu item and indicates the factory settings.

Table- 3 Descriptions for Outline of Setup Menu Item

Menu item	Factory Setting	Selectable Parameters
bAUd	9600	Baud rate: 2400, 4800, 9600, 19200
PArt	none	Parity: odd, even or none
Data	8-b	8 bits or 7 bits (Stop bit is always 1 bit)
Echo	oFF	Echo: “on” or “oFF”
Prnt	oFF	Print: “on” or “oFF”
beep	4800	Driving frequency: 4800, 2400, 1200, 600 Hz. “oFF” means to disable beep.
LbUt	oFF	Lock buttons, “oFF”: enable pushbuttons “on”: disable pushbuttons
AoFF	15	1~99 minutes, “oFF” means to disable auto power off.
blit	30	1~99 seconds, “oFF” means to disable turning off backlit automatically.
boFF	oFF	Bright level of backlit at OFF state: oFF~09
bon	09	Bright level of backlit at ON state: oFF~09
dEFA	rSt	Reset above item to factory original setting.

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■ *Baud Rate*

The baud rate is selected for remote control. It can be set to 2400, 4800, 9600 or 19200. To select your request as follows:

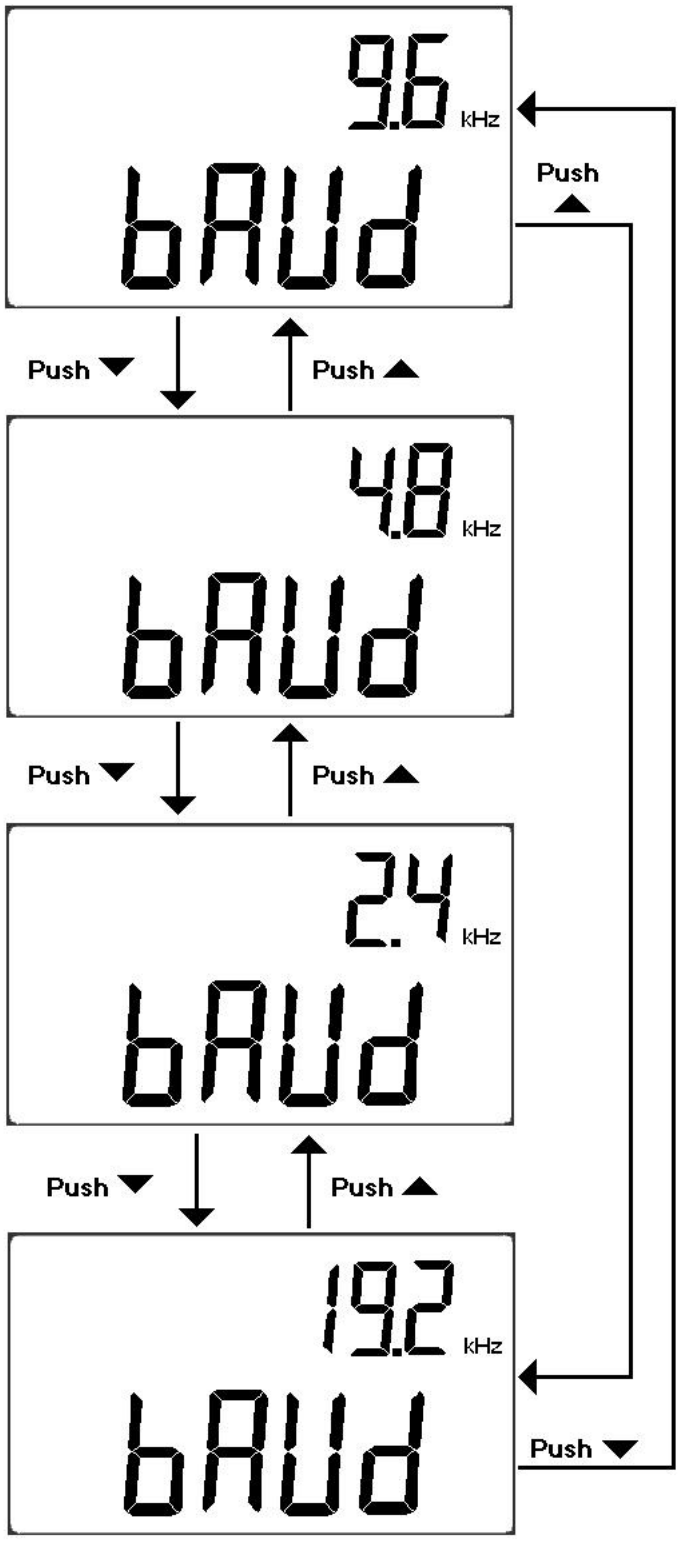

Figure- 5 Baud rate setup for remote control

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■ *Parity Check*

The parity check is selected for remote control. It can be set to none, even or odd bit. To select the parity as follows:

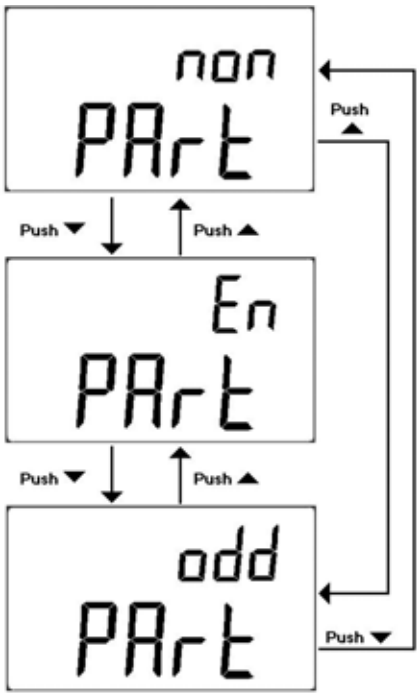

Figure- 6 Parity Check setup for remote control

■ *Data Bit*

The data bit is selected for remote control. It can be set to 8 or 7 bits. The stop bit is defined to 1 bit and can't be changed. To select the data bit as follows:

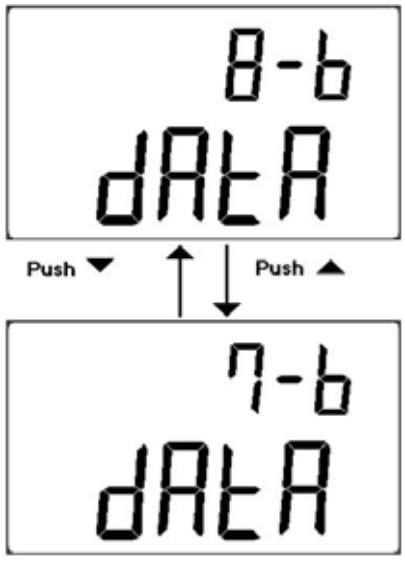

Figure- 7 Data bit setup for remote control

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■ *Echo*

With ECHO ON, the meter echoes (returns) all the characters whatever it receives. To enable the Echo as follows:

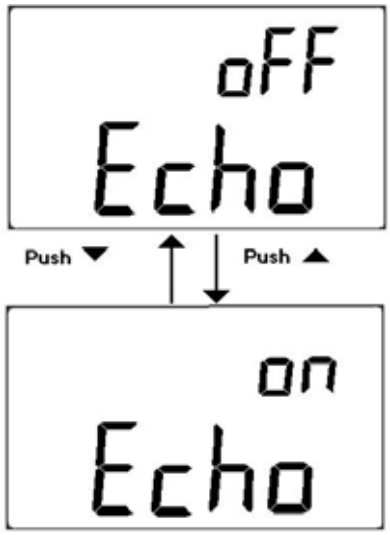

Figure- 8 Echo Setup

■ *Print only*

If the remote interface of the meter is under Print-only mode, the meter will print out the measured data when the measuring cycle is completed. The meter will auto send the newest data to a host continuously. The meter doesn't accept any commands from the host under Print-Only enabled. The remote indicator of the meter will be flashed during operation as Print-only ON. To enable the print-only as follows:

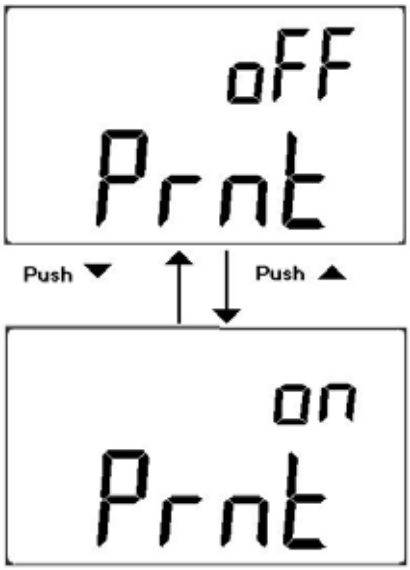

Figure- 9 Print-only Setup

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■ *Beep Frequency*

The driving frequency can be set for 4800, 2400, 1200 or 600. The beeper can be set to ”oFF” as you want kept silent during operation, to select a tone you like according to follows:

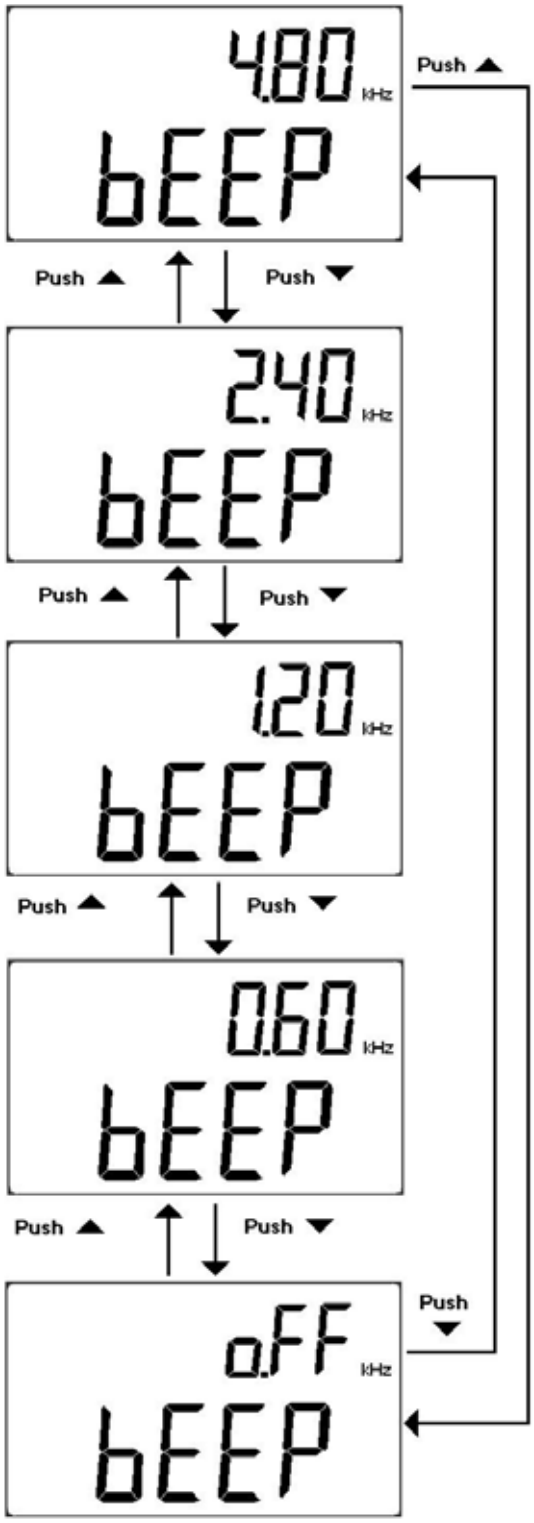

Figure- 10 Driving frequency of Beeper setup

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■ *Lock Buttons*

The pushbuttons can be disabled by this option. When set to “on”, the pushbuttons will not be operated after turned on the meter. The power-ON option still can be operated as locked the buttons.

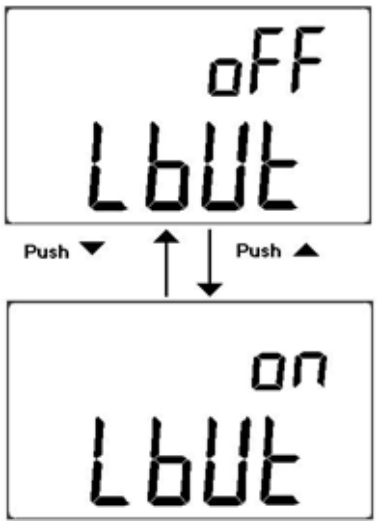

Figure- 11 Lock buttons

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■ *Auto Power Off*

The timer for Auto Power Off can be set to 1~99 minutes, “oFF” means to disable auto power off. To set timer as follows:

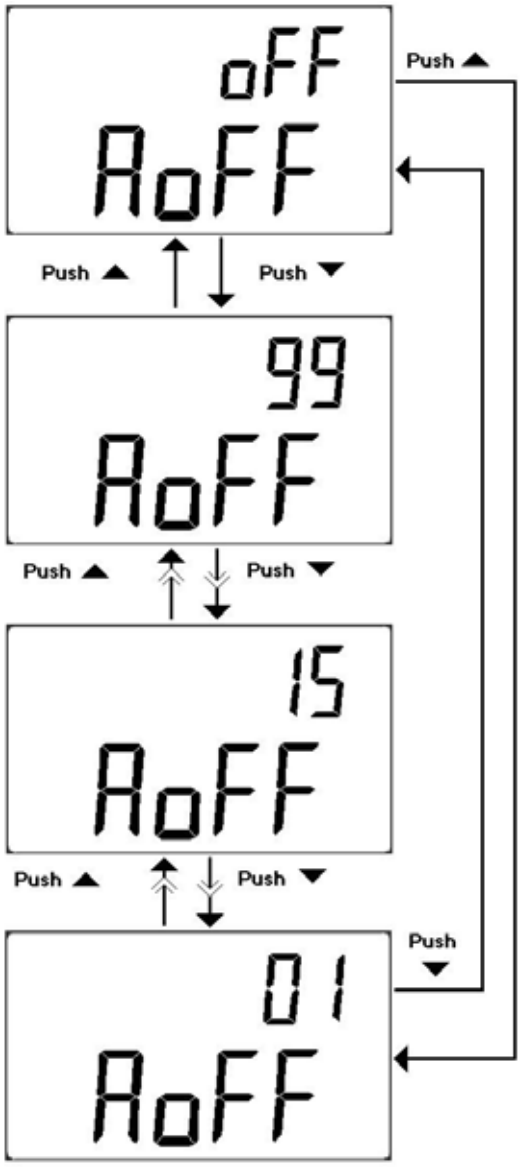

Figure- 12 Auto power saving setup

The instrument may automatic turn off within a setting period, if none of the following happens.

a. Push buttons are used.
b. Static recording is set.
c. Auto power off has been disabled by Setup mode.

You can toggle OFF, and then turn on again to activate the meter after auto power off, or push any button to wake up. When the meter is to be used for longer period, you may disable the APO. The sign AOFF will be turned off when APO disabled. The meter will stay on continuously as the APO is disabled.

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■ *Backlit Display*

The timer can be set to 1~99 seconds, “oFF” means to disable turning off backlit automatically. The backlight will be turned off automatically after a setting period. To set the period as follows:

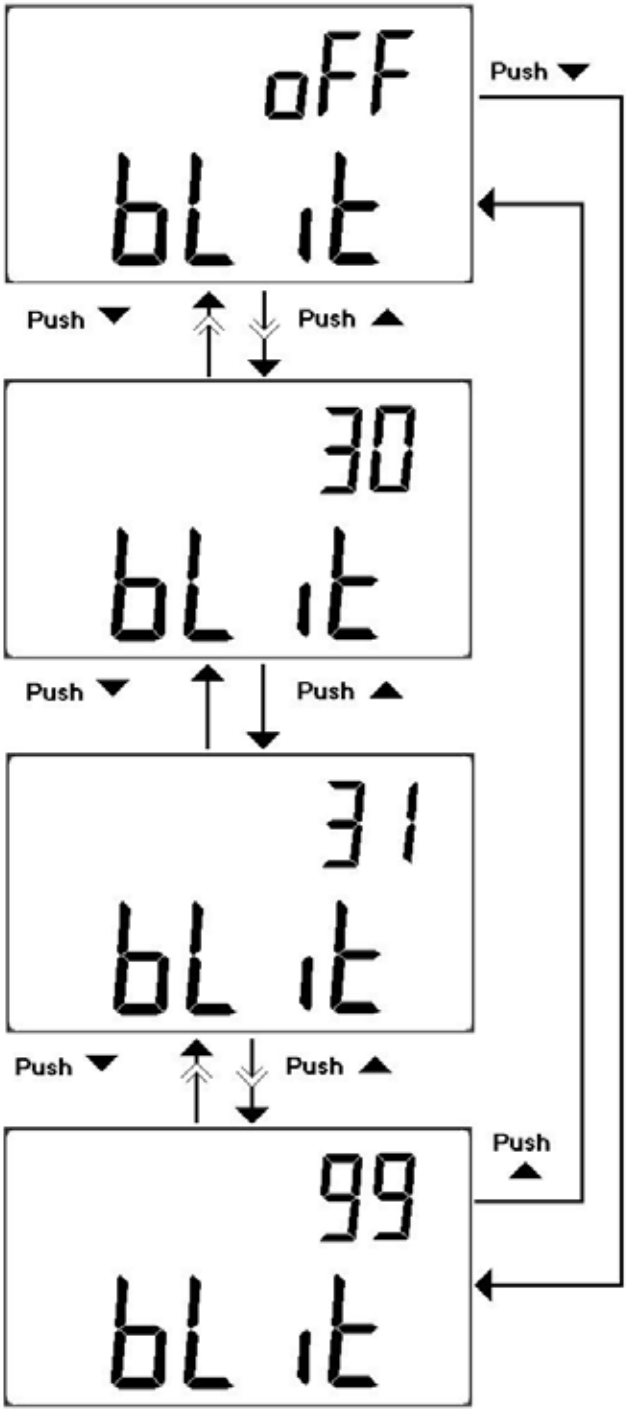

Figure- 13 Backlit Timer Setup

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■ *Bright level of Back-lit for OFF state*

This option will help you to set the bright level for off state of backlit. The brightness can be set from “oFF~09”.

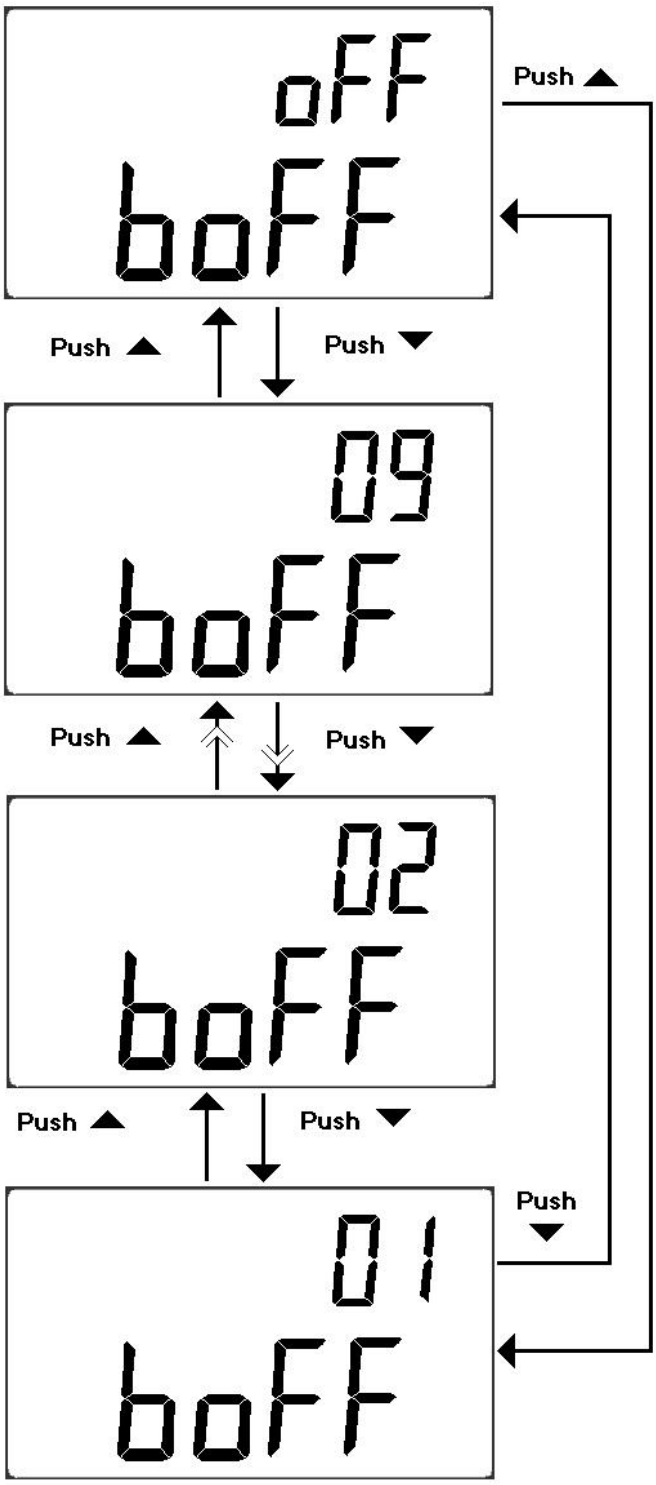

Figure- 14 Bright level for OFF state

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■ *Bright level of Back-lit for ON state*

This option will help you to set the bright level for ON state of backlit. It is used to set brightness after turn backlit on. It can be set from “oFF~09”. When you turn backlit on during normal operation, push SET button one time can increase one bright level. The adjusting range is from default to “09” then back default. For example, if you set the level to “05”, you can push SET button to increase the level from 05→ 06→ 07→ 08→ 09 then back 05 after turned backlit on as normal operation. If the default is “09”, you will not feel any change by pushing SET button.

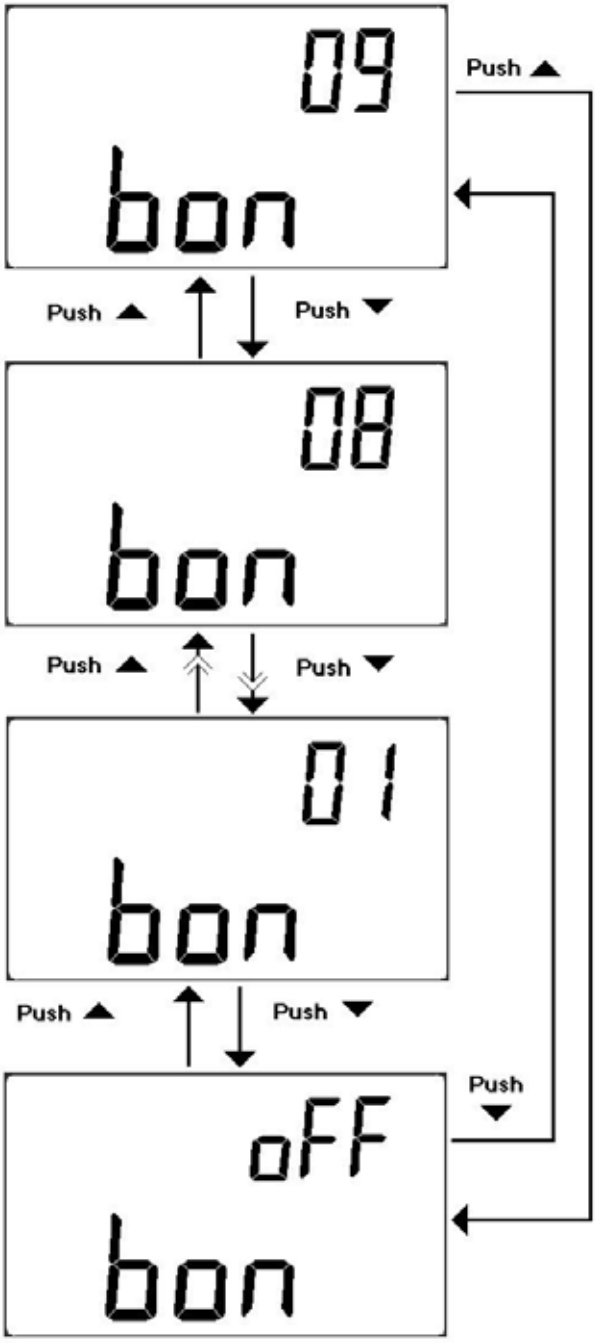

Figure- 15 Bright level for ON state

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■ *Reset to Default*

Push **SAVE** button for more than one second to reset the setting to factory default. The setup mode will be set to Baud Rate menu item automatically after finished reset.

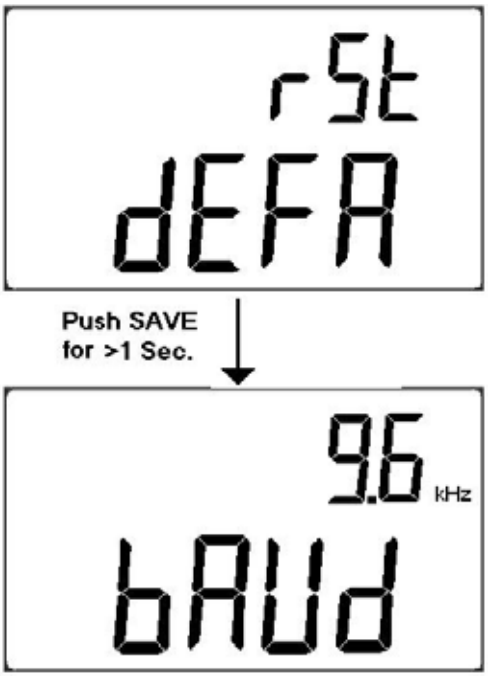

Figure- 16 Reset to default

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CALCULATION FUNCTION

This meter provides operators with various functions including:
☐ **Static Recording**
☐ **Data Hold/ Trigger**
☐ **Relative**
☐ **Tolerance mode**
☐ **Compare mode** (•))))

■ *Static Recording*

The Static recording mode can record the maximum capacitance and minimum capacitance you measured. Further more it will calculate average value you measured. Static recording captures only stable values and updates the memory; the meter will not record which the values are "**OL**" (overload) or below 10 counts.

The operational procedures are described below:

1. Press **REC** momentarily to enter the static recording. The present value is stored to memories of maximum, minimum and average. The **MAX AVG MIN** annunicator will be lit.
2. Press this button momentarily to cycle through maximum, minimum, average and present readings. The **MAX**, **MIN**, **AVG** or **MAX AVG MIN** annunciator turns on respectively to indicate which value is being displayed. See following **Figure.**
3. The beeper sounds a tone when a new max or min value has been recorded.
4. Selecting static recording mode as auto range, it will record the value of MAX, MIN or AVG for different ranges.
5. Press **REC** button for more than 1 second to exit recording mode.
6. The feature of auto power off will be disabled and the "AOFF" will be turned off as recording mode

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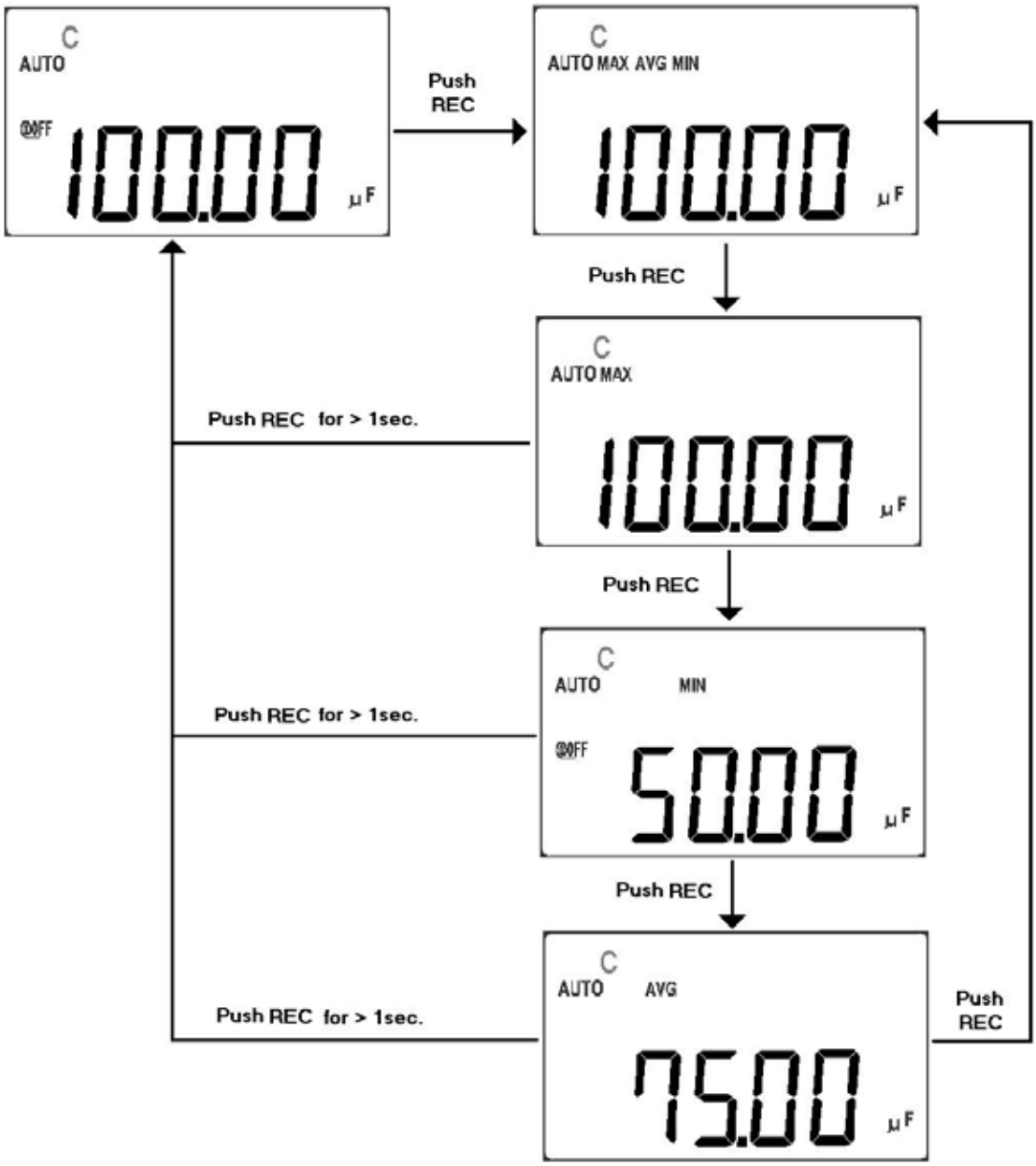

Figure- 17 Static Recording Mode

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■ *Data Hold/ Trigger Hold*

The data hold function allows operators to hold the displayed digital value. Press **HOLD** button to freeze the displayed value and enter manual trigger mode, and the sign of **DH** will be displayed. Press **HOLD** button again to trigger another new measuring value updated to display. The sign of **DH** will be flashed before the new updates. Press **HOLD** button for more than one second to exit this mode.

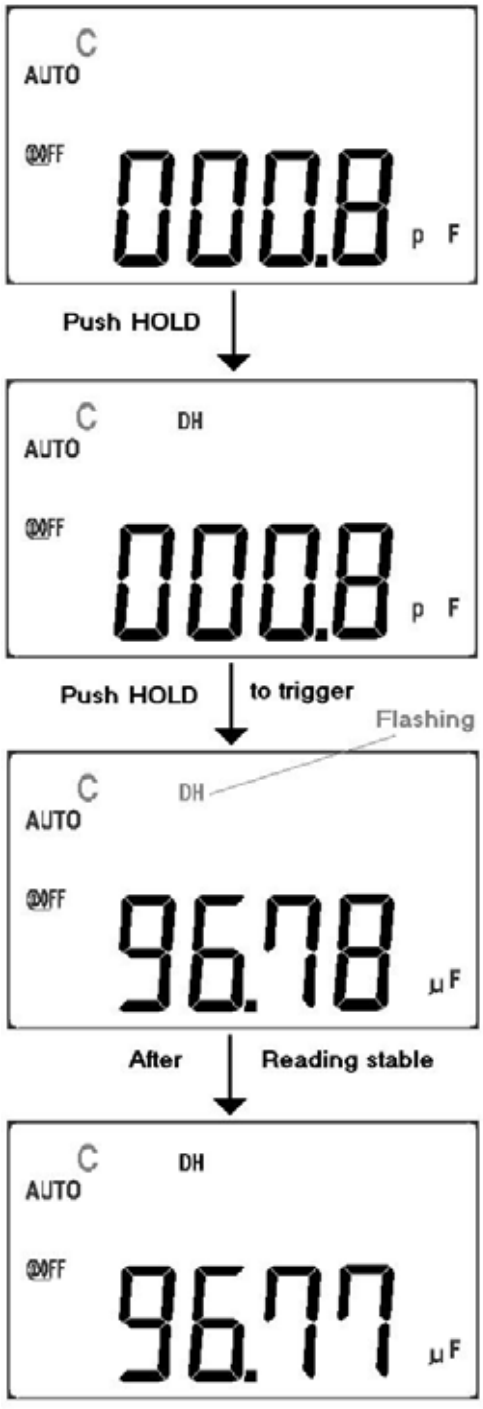

Figure- 18 Data/ Trigger Hold Operation

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■ *Relative (Zero)*

The relative function subtracts a stored value from the present measurement and displays the result.

1. Press **REL** button momentarily to set the relative mode. This sets the display to zero and stores the displayed reading as a reference value and the sign of **REL** will be displayed.
2. The relative mode can be set at auto or manual range, but can't be set when an overload has occurred.
3. Press **REL** button momentarily to set the relative mode again
4. When the small capacitance measurement, the display will reads a non-zero value due to the presence of alligator clip leads. You can use the relative function to Zero-Adjust the display.
5. Press and hold **REL** button for more than 1 second to quit Relative mode.

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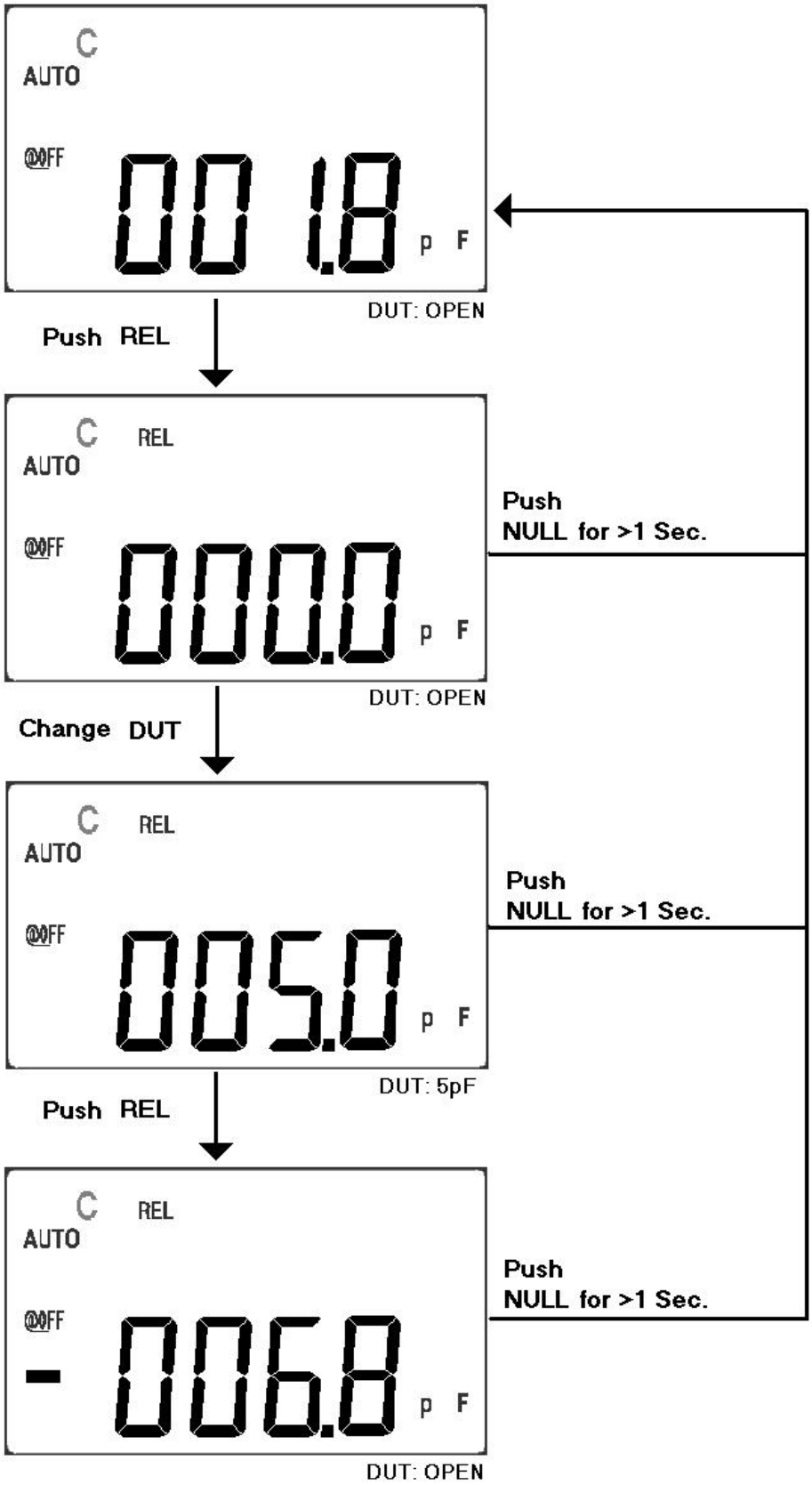

Figure- 19 Relative (Zero) Operation

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■ *Tolerance Mode*

There are 1%, 5%, 10% and 20% tolerance ranges. To enter the tolerance mode, insert a standard value into the socket. Press the **TOL** button to set display value to be the standard reference. Similarly, the DH value which appears on the primary display can be used as a standard value to sort components. Press TOL button again to cycle through 1%, 5%, 10% and 20% tolerance as desire. The meter range locks as tolerance mode. This mode can not be set under following condition:

- After setting the recording mode.
- After setting HI/LO Audible Alert mode.
- The tested display is either OL or below 10 count.

This function is designed for sorting. An audible tone will sound three times when the reading out of the set tolerance. A single tone presents the reading within the selected tolerance.

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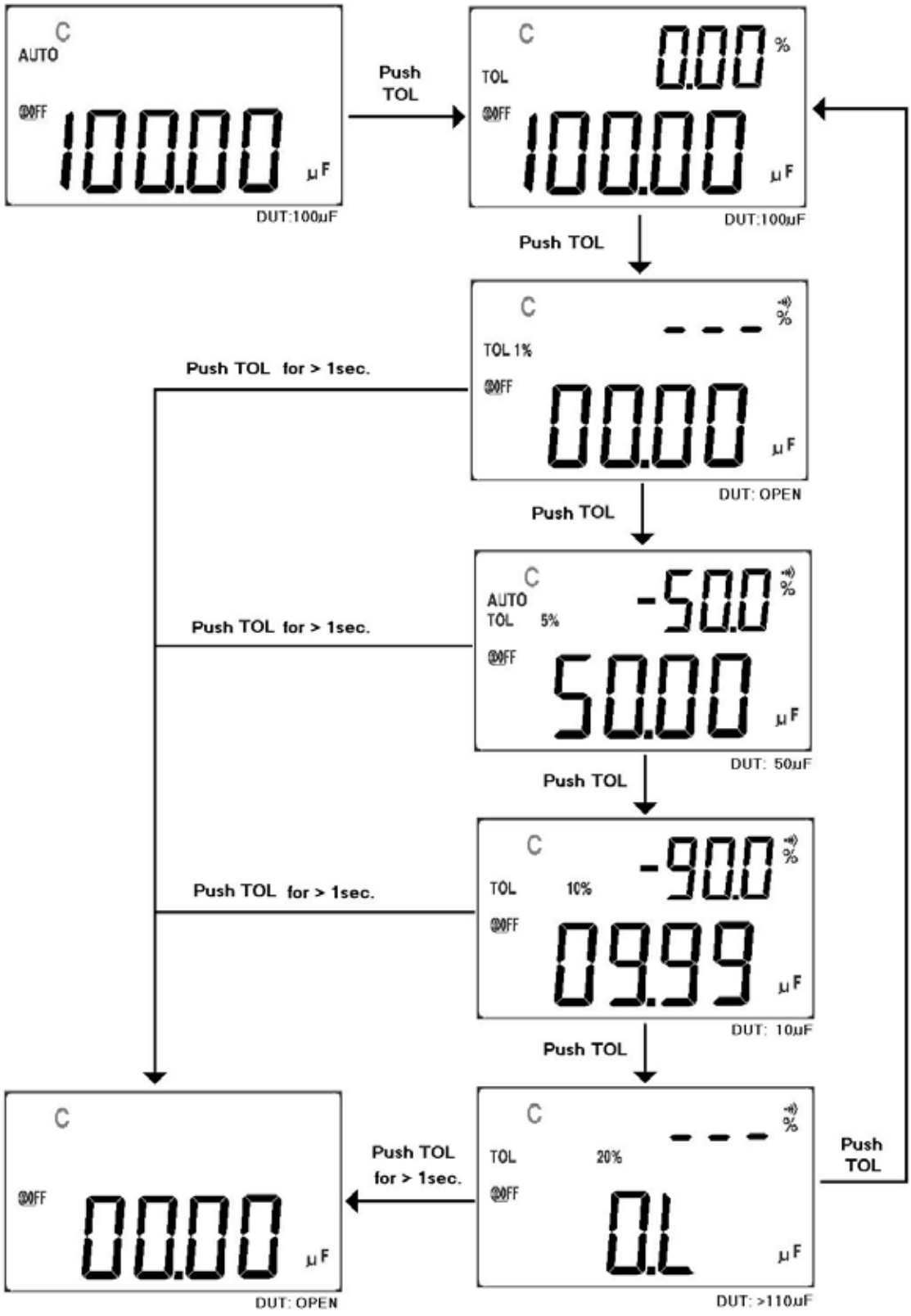

Figure- 20 Tolerance Operation

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■ *Compare Mode (•)))*

This function will help you sort capacitors, and you can set 25 sets of limit ranges. This meter has initial set for High and Low limits, see below table:

Comparison Set	High limit	Low Limit
1	100	90
2	120	108
3	150	135
4	180	162
5	220	198
6	270	243
7	330	297
8	390	351
9	470	423
10	560	504
11	680	612
12	820	738
13	1000	900
14	1200	1080
15	1500	1350
16	1800	1620
17	2200	1980
18	2700	2430
19	3300	2970
20	3900	3510
21	4700	4230
22	5600	5040
23	6800	6120
24	8200	7380
25	10000	9000

You can change these sets, please refer to the SET High/ Low limits for detailed description. Also you can use the power-on option to restore factory setting.

Following procedures will guide you to set compare mode:

1. Press •))) button momentarily to enter HI/LO Audible Alert mode. The meter locks range in this mode. The " •))) " annunciator will be indicated, and the secondary display will indicate "**C01**" to "**C25**" which the set you saved as last operation. The first left digit means comparison mode. The last two digits indicate current comparison set. The primary display will indicate the present measurement. It is ready to test.
2. Press •))) button momentarily to select different sets. The secondary display will indicate "**C01**" to "**C25**" according to which comparison set has been selected. You can press and hold **SAVE** button for more than one second to save comparison set for next entry.

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3. Press **HI/LO** button to see the HI or LO value used for comparison and back to the ready mode cyclically. The HI or Lo limits will be briefly indicated on 1st display, and then back to the ready mode.
4. If the reading is out of the high and low limits, the beeper will sound three tones, also the secondary display indicates "**nGo**". If the reading is within the high and low limits, the beeper sounds a tone, and the secondary display indicates " **Go**". After 3 seconds the meter will return to ready state.
5. Press and hold the" •))) " button for more than 1 second to exit audible alert mode.

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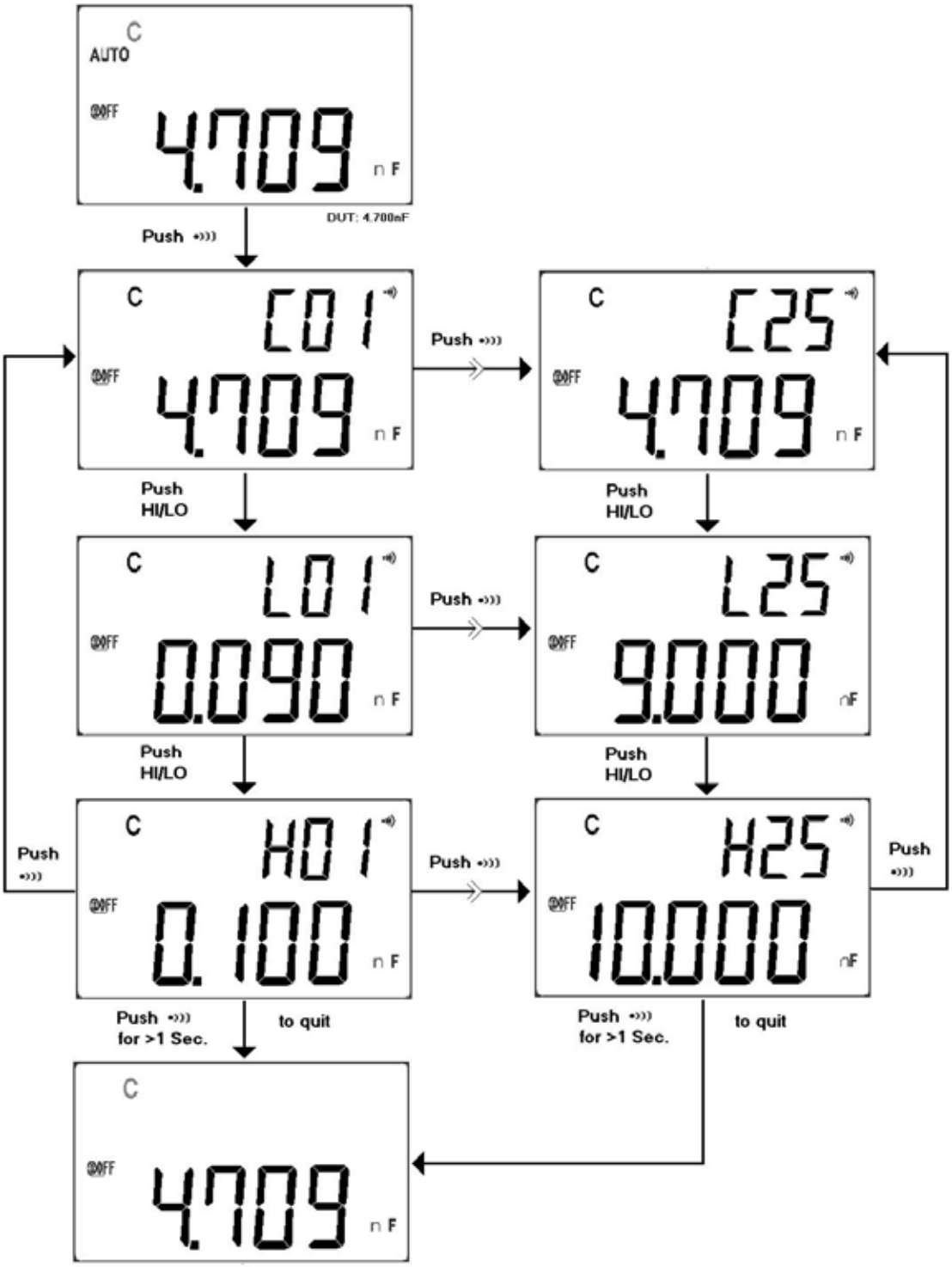

Figure- 21 Set Compare Mode

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The following figure shows you the display by compare mode for sorting:

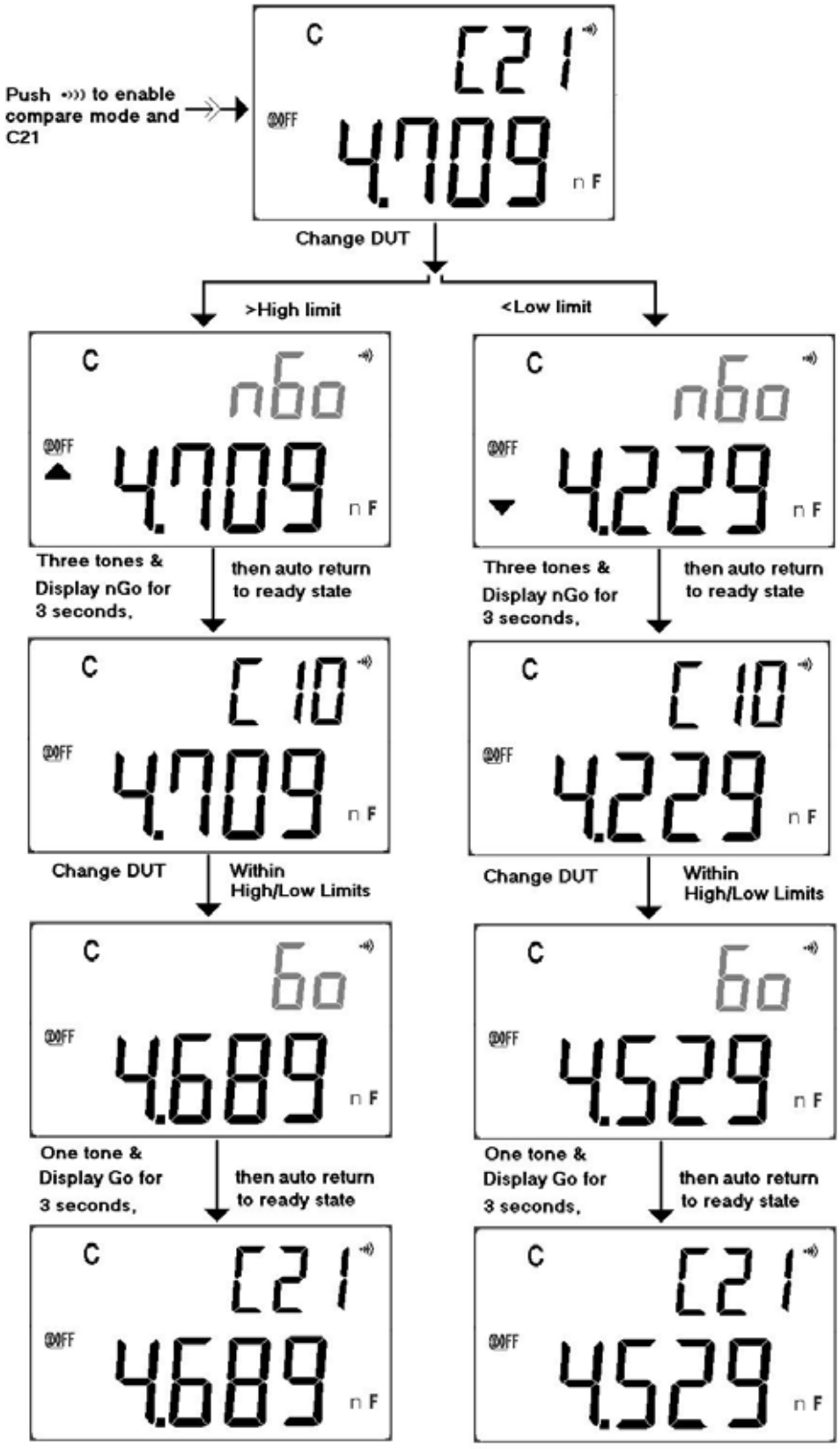

Figure- 22 Sorting by compare mode

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Set high/ low limits

Using this mode to set the HIGH and LOW limits for compare mode, see the following procedures:

1. Press and hold the "**SET**" button for more than 1 second to enter the HI/LO limit setting mode.
2. The secondary display will flash "**L01**" and the primary display will indicate the limit value. Following buttons will be used for this setting mode:
   a. ◀ **(LEFT)** or ▶ **(RIGHT)**: select which digit will be adjusted.
   b. ▲ **(UP)** or ▼ **(DOWN)**: to Increase or decrease the current digit value.
   c. **HI/LO:** Select High or Low limit to be set.
   d. **SAVE:** Press this button for more than 1 second to store the setting value into the memory. The beeper will sound two tones means the selected value has been stored. If the current setting can't meet the rule that the high limit must equal or greater than the low limit, the beeper sounds three tones ("BE-BE-BE").
   e. **SET:** Select next compare setting. Press this button momentarily to cycle through #01 to #25 then come back to #01 setting according to High or Low limit.
3. Press and hold the "**SET**" button for more than 1 second to exit the HI/LO limit setting mode.

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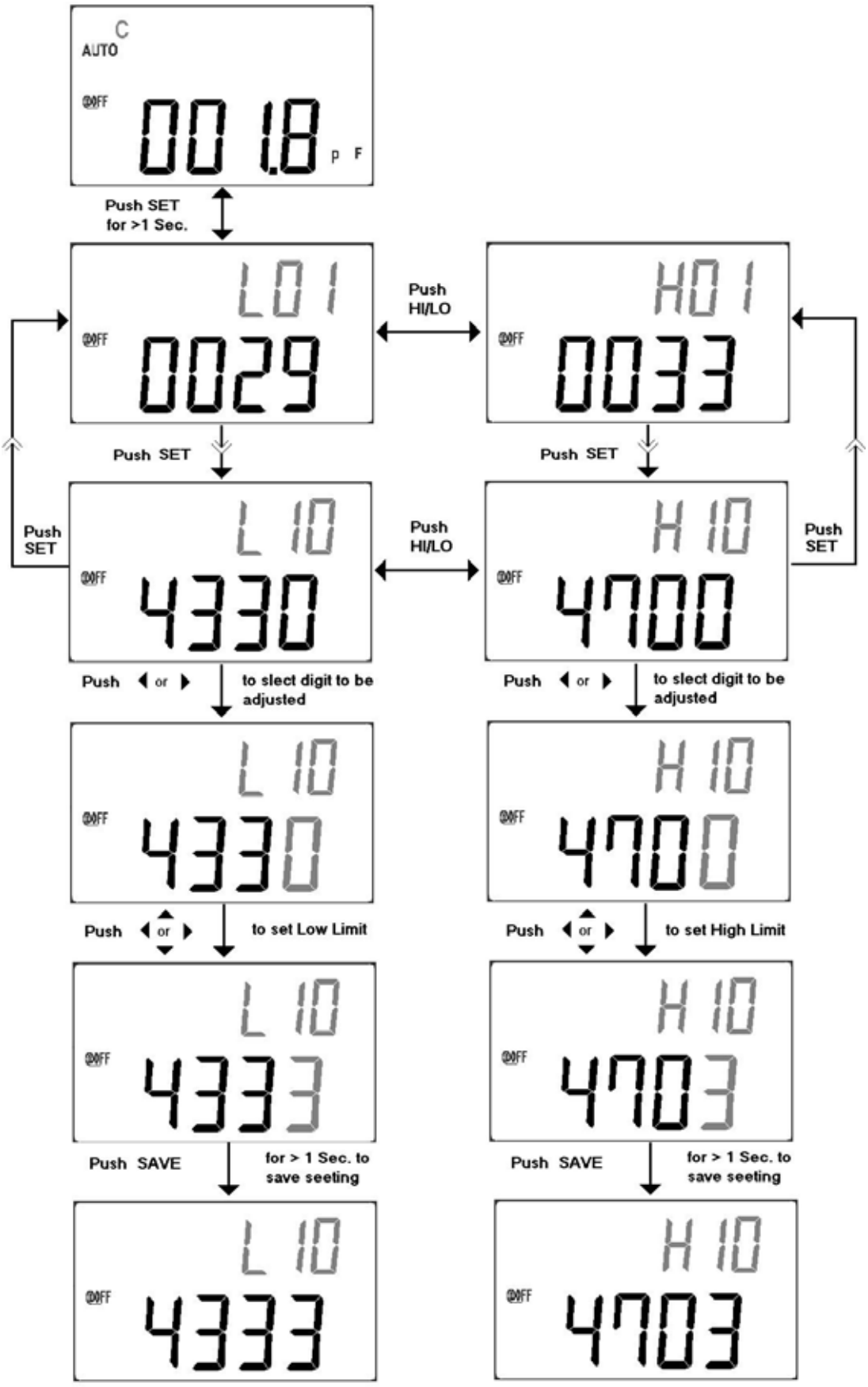

Figure- 23 SET High/ Low Limits

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REMOTE COMMUNICATION

This instrument has a bi-directional (full duplex) communication capability. This function will assist user to record and keep data easily. The protocol is provided by SCPI commands (Standard Commands for Programmable Instruments). You can simply use your familiar language to design what application software you want. All commands are combined by ASCII character, non-hexadecimal, which is much user friendly providing. Just configure the measuring range, and then get the measuring value. The detail SCPI for remote operation is accompanied with another file on this CD-ROM. Please refer to.

An optional accessory includes an optical USB-RS232 cable and a CD-ROM for PC application software.

Please refer following procedures if you want to communicate with personal computer:

1. Setup the communication parameters for the meter and the personal computer you used. The meter is default to (9600, n, 8, 1).
2. Be sure that the driver for USB and RS-232 transfer has been installed on your computer.
3. Fixes optic side of cable to communication port of meter, Be sure the text side to be face up. See following figure.
4. Plug the other end of USB terminal of cable into USB port of personal computer. See following figure.

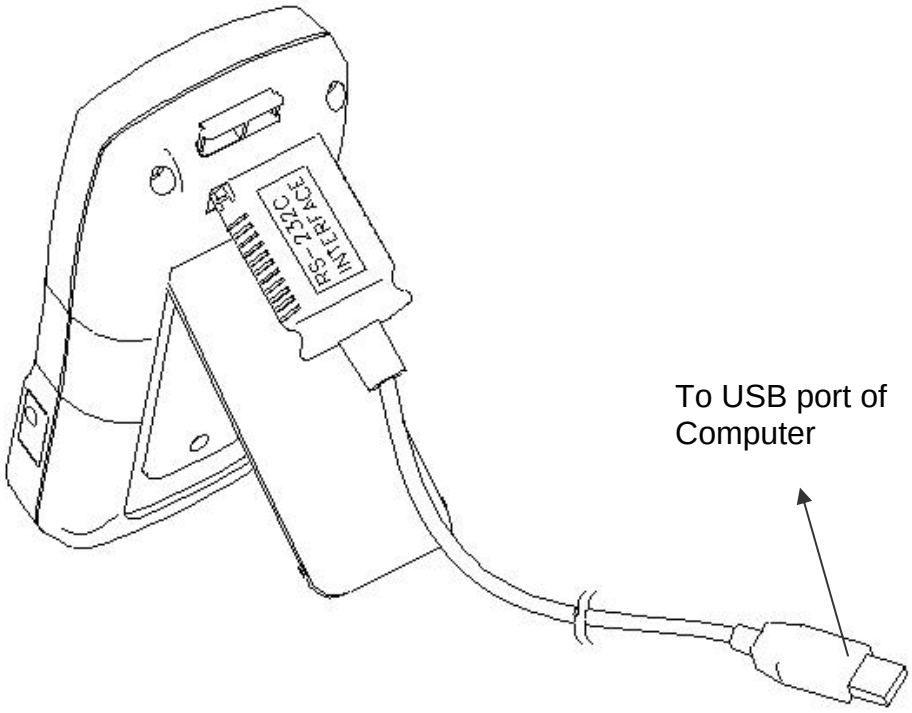

Figure- 24 Cable Connection for Communication

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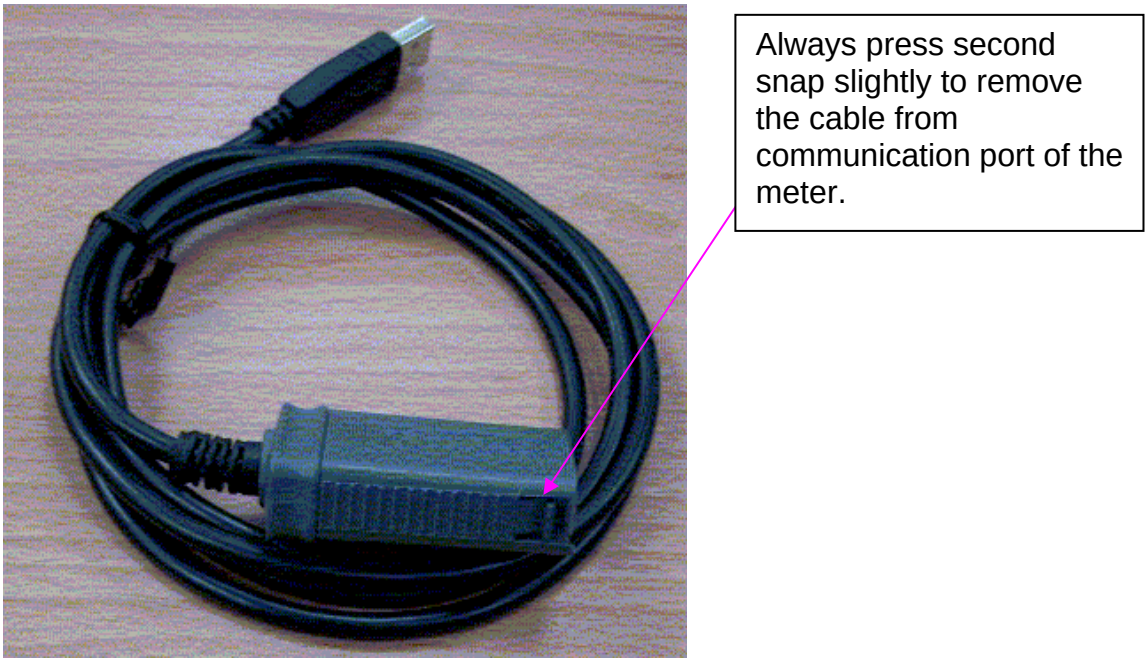
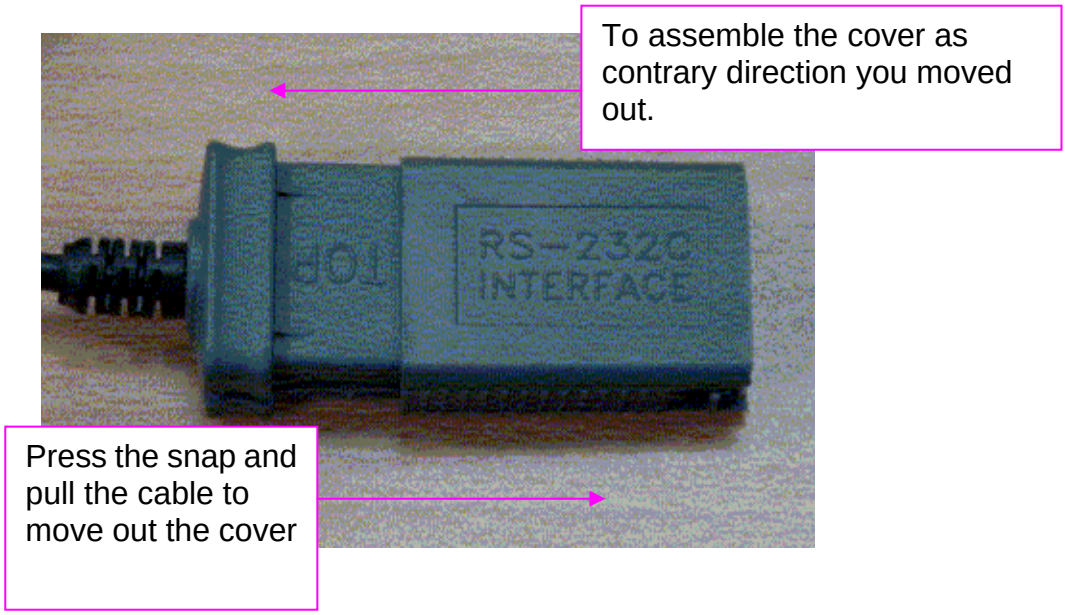
5. Execute the software to take the data as your needs.
6. Always press second snap slightly to remove the cable from communication port of the meter. See the snap as below picture.



7. We don't suggest you to remove the cover of USB-RS-232 cable. But sometime, you may press snap deeply and pull the cable to cause the cover to be moved out as following picture. To assemble the cover as contrary direction you moved out. Be sure the text side on the cover at same side of inside TOP case. You will hear a click as the cover has been fixed


To assemble the cover as contrary direction you moved out.
RS-232C
INTERFACE
Press the snap and pull the cable to move out the cover

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CAPACITANCE MEASUREMENT

⚠ Caution

To avoid possible damage to the meter or the equipment under test, disconnect circuit power and discharge the capacitor before measuring capacitance.

Capacitance is the ability of a component to store an electrical charge. The unit of capacitance is the farad (F). Most capacitors are within the range for nanofarad (nF) to microfarad (µF). The meter measures capacitance by charging the capacitor with a known current, measuring the resulting time of charging period, and then calculating the capacitance. The larger capacitors will take longer time to charge. The sign of "**C**" flashing means charging capacitor. To improve the measurement accuracy of small value capacitance, press **REL** with the alligator clip leads open to subtract the residual capacitance of the meter and leads.

Measuring tip: For measuring the capacitance more than 1000µF, you can discharge capacitor first and select suitable range to measure it. That will speed up measuring time for get the correct value.

1. Turn on the meter.
2. To keep the open whatever you use sockets, alligator clip leads or SMD tweezers to test capacitance. And then press **REL** to subtract the residual capacitance of the meter and leads
3. Insert the leads of capacitor into "**+**" and "**-**" input sockets, respectively.
4. Be sure the polarity for capacitor.
5. Remove your hands from capacitor.
6. Read the display.

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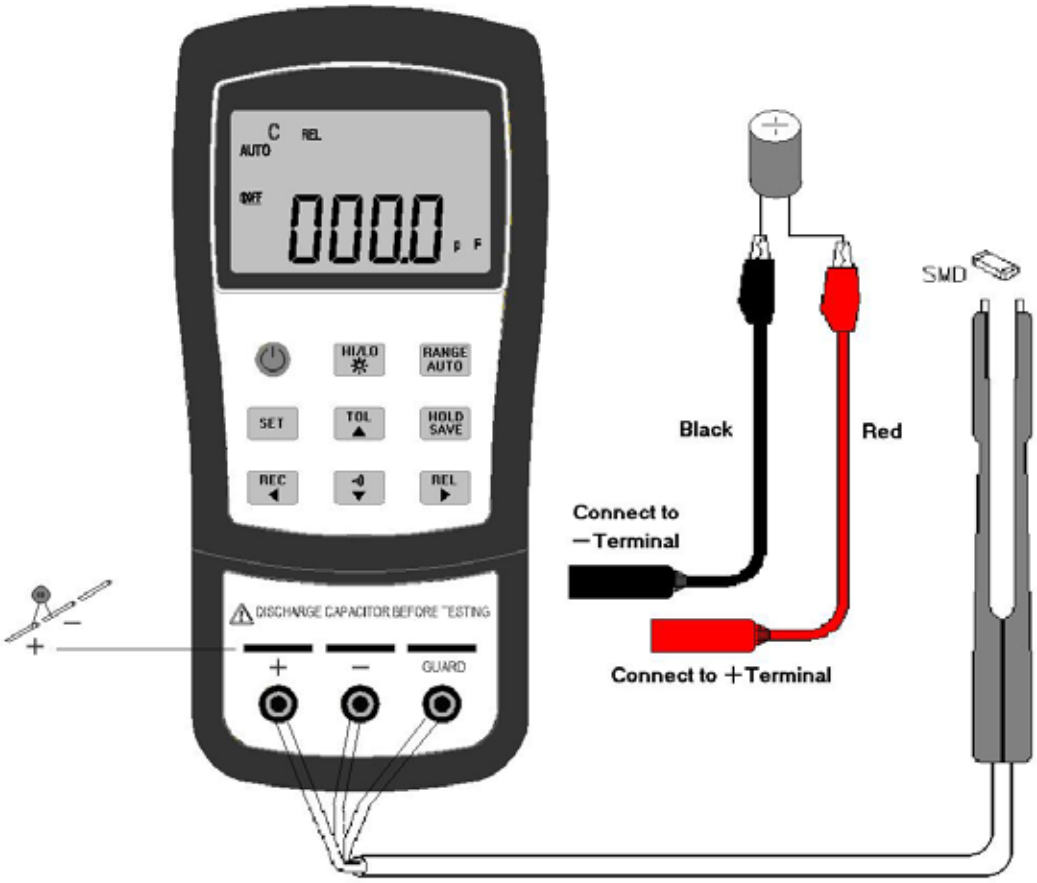

Figure- 25 Capacitance measurement

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CALIBRATING THE METER

⚠ CAUTION!

TO AVOID DAMAGING THE DEFAULT CALIBRATION DATA STORED IN A NON-VOLATILE MEMORY, A CALIBRATION TO THE METER CAN ONLY BE DONE BY AN AUTHORIZED SERVICE CENTER AND QUALIFIED PERSONNEL WITH APPROPRIATE EQUIPMENT.

FOR DETAIL INFORMATION ABOUT CALIBRATION PROCEDURES, PLEASE CONTACT FACTORY OR AUTHORIZED DISTRIBUTOR.

■ *Introduction*

It is recommended to recalibrate and verify the meter at least once a year to ensure that the original designed performance and specifications.
The meter is designed with closed-case calibration capability. It shall calibrate and verify by remote software with appropriate equipment and qualified personnel only. The related software may be got by factory authorization

■ *Environmental condition*

Calibration or verification test should be performed under laboratory condition which ambient temperature/ relative humidity can be controlled.

■ *Warm up*

Allow up to 1 minutes warm-up at least before performing calibration to the meter. After exposure or storage in a high humidity (condensing) environment, relative recovery period is required essentially.

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■ *Recommended test equipment*

The test equipment requirements listed in Table or equivalents are required to perform the calibration and performance verification test procedures. Alternative equipment may be used as long as the accuracy is as good as those listed at least.

Table- 4 Standard Equipment Requirements

Standard Source	Operating Range	Accuracy Required	Recommended Equipment
Capacitance Calibrator	1nF~10nF 100nF~10mF	≤ ± 0.5% ≤ ± 0.25%	Fluke 5520A or equivalent

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SPECIFICATIONS

■ *General specification*

Display:
- 4 1/2-digit liquid crystal display (LCD) with maximum reading of 11000 counts.
- Automatic polarity indication.

Function:
- Capacitance measurement by DC charge and discharge method. .
- Visible and audible Tolerance mode assists you to sort the capacitor
- Min/Max/Average, Data Hold with Manual or Auto Trigger and Relative modes
- Comparison mode with 25 sets of HI/LO limits can be selected
- Backlit display for easy reading in the dark.
- Bi-directional optic computer interface with SCPI commands
- One-year calibration cycle suggested.

Measuring rate (Approx.):
- 5 times/s for capacitance <100µF.

Low battery indicator:
The " " appears when the battery voltage drops below 6.0V (approx.).

Operating temperature: 0°C to 50 °C (32ºF~122ºF)

Storage temperature: -20°C to 60°C (-4ºF~140ºF) without battery

Relative Humidity (R.H.): maximum 80% R.H. for temperature up to 31°C decreasing linearly to 50% R.H. at 50°C

Temperature coefficient
0.1 * (specified accuracy) / °C (from 0°C to 18°C or 28°C to 50°C)

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Power supply:
Single standard 9V Battery can use Alkaline or Carbon-zinc.

Battery types	ANSI/ NEDA	IEC
Alkaline	1604A	6LR61
Carbon-zinc	1604D	6F22

Power Consumption: 270mVA maximum with backlit

Battery life: 80 hours without backlit (approx.) (Based on new alkaline 9V/545mA Battery)

Dimension: 41 (H) * 87 (W) * 184 (L) mm

Weight: 320 grams with battery/ 430 grams with full package.

Standard Accessories:
Alligator clip leads, 9V battery, Quick start guide and Instruction manual in CD-ROM.

Optional Accessories:
Communication package, SMT Tweezers and Soft carrying case

Safety: Designed in compliance with EN61010-1 (IEC1010-1) for CAT-II 50V, Pollution Degree II Environment. EMC designed in compliance with EN61326-1.

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■ *Electrical specifications*

Accuracy is given as ±(% of reading + counts of least significant digit) at 23°C ± 5°C, with relative humidity Less than 80% R.H.

☐ Capacitance

Range	Resolution	Accuracy*2	Measuring rate as full scale (approx.)
1000.0pF	0.1pF	1%+10	5 times/sec
10.000nF	0.001nF	1%+5	5 times/sec
100.00nF	0.01nF	0.5%+3	5 times/sec
1000.0nF	0.1nF		5 times/sec
10.000μF	0.001μF		5 times/sec
100.00μF	0.01μF		5 times/sec
1000.0μF	0.1μF		0.86 times/sec
10.000mF	0.001mF	1%+5	0.13 times/sec
199.99mF	0.1mF	2%+5	0.006 times/sec

Notes:

1. Overload protection: 250VR.M.S.
2. The accuracy is specified to measure film capacitor or better, and use Relative mode to zero residual first.

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MAINTENANCE

■ *Service*

⚠ WARNING
To avoid electrical shock, do not perform any service unless you are qualified to do so.

If the instrument fails to operate, check battery and alligator clip leads, and replaces them if necessary. If the instrument still can't work, double check operating procedure as described in this instruction manual. When servicing, use specified replacement parts only. Following table will guide you to identify basic problems:

Malfunction	Identification
No LCD indication as power ON	• Check whether the power button has been locked completely. • Check battery or replace battery.
No beeper tone	• Check setup mode whether the beeper has been set to OFF. Then select the driving frequency you want
Pushbuttons failure	• Check whether the meter is under remote control. • Turn OFF and then turn ON the meter again. • Check the setup mode whether "Lbut" of lock buttons has been set "on".
Failed on Remote control	• The optical side of cable connected to meter, the text side of cover should be up. • Check the baud rate, parity, Data bit, Stop bit (default is 9600, n, 8, 1) • Driver install for USB- RS232.

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■ *Battery replacement*

> ⚠ **WARNING**
> **Remove all test leads and external adaptor before opening the case.**

The meter is powered by 9 V battery, be sure to used specified battery. To ensure the specification specified, it is suggested to replace battery immediately as the sign of [+ −] is displayed and flashing. Following procedures for battery replacement:

1. Remove alligator clip lead and turn off the meter.
2. Release the screw on the battery cover.
3. Slide pull down the battery cover.
4. Then take up the cover.
5. Replace the specified battery.
6. Reverse the procedure of opening cover to close the bottom cover.

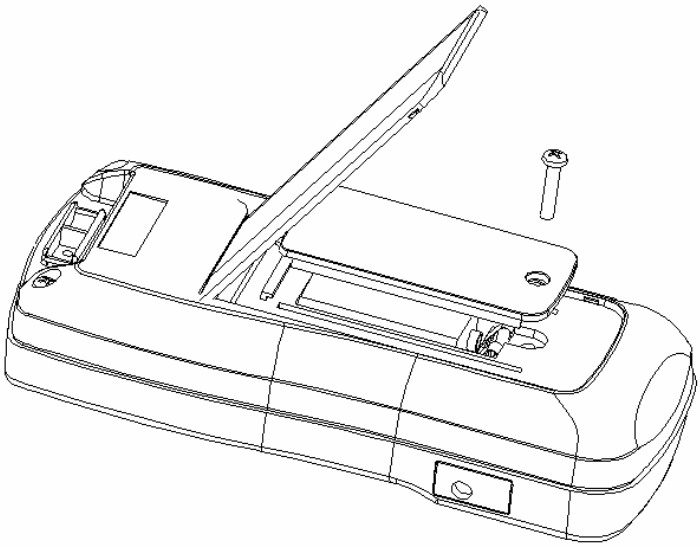

Figure- 26 Battery Replacement

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■ *Cleaning*

> ⚠ **WARNING**
> **To avoid electrical shock or damage to the meter, do not get water inside the case.**

To clean the instrument, use a soft cloth dampened in a solution of mild detergent and water. Do not spray cleaner directly onto the instrument, since it may leak into the cabinet and cause damage. Do not use chemicals containing benzine, benzene, toluene, xylene, acetone or similar solvents to clean the instrument. After cleaning, make sure the instrument is dried completely before using.

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ACCESSORIES

■ *Standard accessories*

	Quick start guide
	Instruction Manual in a CD-ROM
	Alligator clip leads
	9V Carbon-zinc battery

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■ *Optional accessories*

	Communication Package Communication package included full isolation optical cable and software disc.
	SMD Tweezers This SMD Tweezers is used for measuring SMD capacitor and built-in banana input terminals.
	Soft carrying case The dimension of L/W/H is 220/140/55 mm. It provides convenient carrying for the accessories and the handheld meter.

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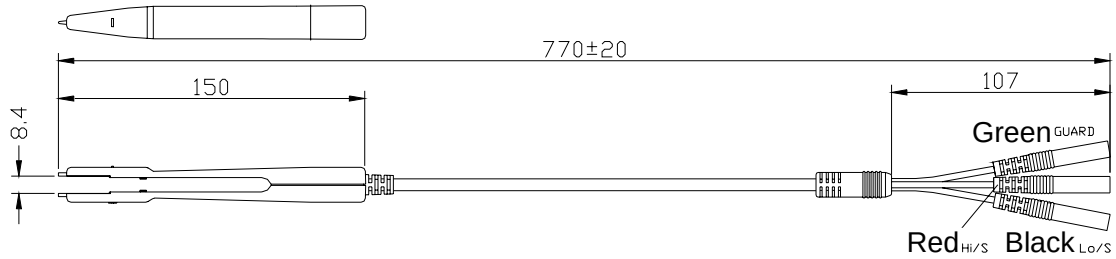
SMD Tweezers

This SMD Tweezers is used for L/C/R meter and built-in banana input terminals. It is much convenient to measure the SMD components.

Recommended to measure surface mount device is as well as maximum open of tweezers. The tweezers has one red, one black and one green 4 mm shrouded plugs, which are connected to the meter's "+"(H-SENSE), "-"(L-SENSE) and GUARD ends, respectively. The length is 770 mm (30.3") approximately. See below Figure.



☐ Electrical Characteristic

Parameters	Test Condition	100Hz	120Hz	1kHz	10kHz
Cp Parallel Capacitance	Tweezers Open	< 5.0 pF	< 5.0 pF	< 5.0 pF	< 5.0 pF
Rs Series Resistance	Tweezers Short	< 0.15Ω	< 0.15Ω	< 0.15Ω	< 0.15Ω
Ls Series Inductance	Tweezers Short	<1.0 μH	<1.0 μH	<1.0 μH	<1.0 μH

Notes:

1. The specification is specified at 23℃±5℃and <75% R.H.
2. The tweezers is recommended to measure the SMD components for C<200μF or L<20mH or R<10MΩ.

☐ Environmental Condition

This Tweezers is for Indoor use/Altitude up to 2000m.
Operation temperature: 0°C~40 °C (32°F~104°F), R.H. 80%.
Storage Temperature: -20°C to 60°C (-4°F~140°F)

⚠ WARNING!

To avoid electrical shock, never use wet Tweezers for your instruments.

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